JUNE 1963
40 CENTS

VHF HORIZONS

220 MC PLUS

- Antennas
- DX News
- 3 Transmitters
- Commercial Equipment Reviews

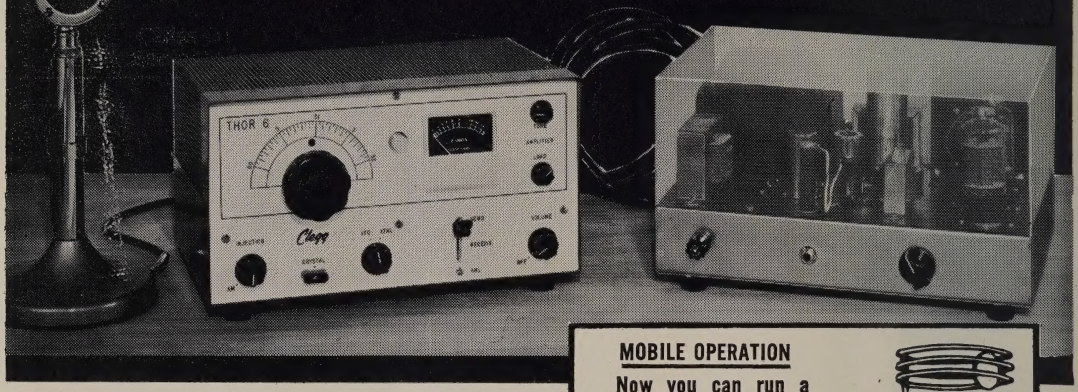
- 1296 Converter
- 417A 2-Meter Converter
- Ultimate HE-45 Conversion

Amateur Radio Above 50 Megacycles

BRAND NEW FROM CLEGG LABS . . . THE

POWER PACKED THOR 6

TRANSCEIVER FOR 6 METERS.



MOBILE OPERATION

Now you can run a mobile "power house" using the new Clegg Model 418 transistorized 12V DC power supply / modulator unit to power your THOR 6 transceiver.

Come on up out of the noise . . . let 'em know you're around! For contests, marginal openings or just overriding the Qrm . . . your new sixty watt, VFO controlled, 100% high level modulated THOR 6 transceiver makes you the "Voice of authority" on six . . . and what's more you'll hear them too! The receiver section with its crystal lattice filter, is selective to the nth degree and so sensitive that even S1 signals are Q5. Sound good? Here's the rest of the story.

TRANSMITTER FEATURES:

- **FULL 60 watts input on phone or CW to 6883 final.**
- **BUILT-IN VFO that automatically tracks the receiver or switches to crystal control for fixed frequency operation.**
- **ALL stages broadbanded for easy QSY.**
- **SPEECH-CLIPPING FOR MAXIMUM talk power.**
- **BUILT-IN PUSH-TO-TALK.**
- **BUILT-IN Keying relay for clean chirpless keying.**

RECEIVER FEATURES:

- **NUVISTORIZED front end for extreme sensitivity at lowest noise level.**
- **CRYSTAL lattice filter for maximum selectivity.**
- **BFO with variable carrier injection for SSB reception.**
- **ULTRA-STABLE tuneable local oscillator that also functions as VFO for transmitter.**
- **EXCELLENT audio characteristics. 2 watts into 3.2 ohm speaker.**
- **Sharp reduction in spurious responses and cross modulation.**
- **Effective noise limiter.**

The THOR 6 is of two unit construction with attractively styled receiver and transmitter rf section mounted in one cabinet for convenient desk top operation. The power supply/modulator section is mounted in a second cabinet for remote location. A ten foot interconnecting cable is provided.

Amateur net price for AC operation $349.95. 12V DC Mod./Pwr. Sup. $100.

Clegg LABORATORIES

DIVISION OF TRANSISTOR DEVICES, INC.

RT. 53, MT. TABOR, N. J. • OAkwood 7-6800

See your Distributor or write for information.

SUREST WAY TO T9X

PR CRYSTALS give you the finest frequency control that money can buy! PRs are built to PERFORM... under good conditions and bad. They have that extra measure of stability and dependability BUILT-IN . . . that *plus* of rugged precision that means years of unfailing service.

With PRs in your rig, you KNOW your signals are going out clear and strong and right on the frequency. You get longer distance, clearer reception, less drift. Yes, PRs are the SURE ROAD TO T9X. Get them from your radio parts jobber. EVERY PR CRYSTAL IS UNCONDITIONALLY GUARANTEED.

PR CRYSTALS

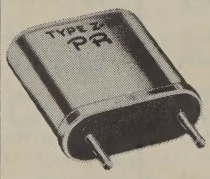
AMATEUR TYPES

Fundamental, PR Type Z-2

Frequency Ranges in Kcs.: 3,500 to 4,000 (80M); 7,000 to 7,425 (40M); 8,000 to 8,222 (20M); 8,334 to 9,000 (6M).

Rugged. Low drift, fundamental oscillators. High activity and power output. Stands up under maximum crystal currents. Stable, long-lasting; ± 500 cycles . . . . . **$2.95** Net (All Z-2 Crystals calibrated with a load of 32 mmfd.)

AMATEUR TYPES



Third Overtone, PR Type Z-9A

Hermetically sealed; calibrated 24,000 to 24,666 and 25,000 to 27,000 Kc., ± 3 Kc.; .050" pins. . **$3.95** Net

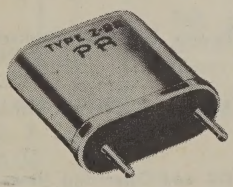
6 Meters, PR Type Z-9A

Fifth overtone; for operating directly in 6-meter band; hermetically sealed; calibrated 50 to 54 Mc., ± 15 Kc.; .050" pins. . . . . **$4.95** Net

CITIZENS BAND CLASS "D"

Type Z-9R, Transmitter

FCC assigned frequencies in megacycles: 26.965, 26.975, 26.985, 27.005, 27.015, 27.025, 27.035, 27.055, 27.065, 27.075, 27.085, 27.105, 27.115, 27.125, 27.135, 27.155, 27.165, 27.175, 27.185, 27.205, 27.215, 27.225, 27.255, calibrated to .005%. (Be sure to specify manufacturer and model number of equipment) . . . . . **$2.95** Net



Type Z-9R, Receiver

Calibrated to .005%. (Be sure to specify manufacturer and model number of equipment . . . . . **$2.95** Net

Type Z-9R, Radio Control

FCC assigned frequencies in megacycles: 26.995, 27.045, 27.095, 27.145, 27.195, 27.255; calibrated to .005% (Be sure to specify manufacturer and model number of equipment.) . . . . . **$2.95** Net

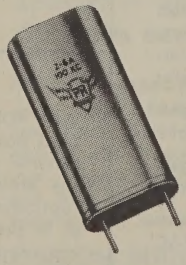
Type Z-1, MARS and CAP

Official assigned frequencies in the range. Calibrated to .005%. 1600 to 10000 Kc. . . **$3.45** Net

Type 2XP

Suitable for converters, experimental etc. Same holder dimensions as Type Z-2. 1600 to 12000 Kc., (Fund.) ± 5 Kc. **$3.45** Net

12001 to 25000 Kc. (3rd Overtone) ± 10 Kc. . . . . **$4.45** Net



Type Z-6A, Frequency Standard

To determine band edge. To keep the VFO and receiver properly calibrated. .050" pins. 100 Kc. . . . . **$6.95** Net

PR Crystals

Since 1934

USE PR AND KNOW WHERE YOU ARE

PETERSEN RADIO COMPANY, INC.
COUNCIL BLUFFS, U.S.A.

COMMERCIAL CRYSTALS AVAILABLE FROM 100 KC. TO 70 MC. PRICES ON REQUEST.

VHF HORIZONS

VOLUME 2 — NUMBER 6
JUNE, 1963

TABLE OF CONTENTS

Advertising, Sales Office
1025 N. Broadway
Oklahoma City 2, Okla.
Telephone 405—CE 2-1108

Call Collect for Advertising Data

Circulation Office
P. O. Box 1557
Oklahoma City 1, Okla.

A Conversion Yet!

TWO-BAND FINAL For 220 432 Mc.

Leroy May, W5AJG
% VHF Horizons
Photo credit: Jim Dungan
KRLD-Dallas

The type T-217/GR transmitter, which is now considered obsolete, may quite often be found in surplus or junk-yard channels these days, and makes a nice source of supply for various components for both the 220 Mc and the 432 Mc bands. At times, complete transmitters can be picked up, and you are lucky indeed if this is the case. However, if this is not the case, various sub-assemblies may also be found, some new, some used. Such a sub-assembly was recently found in this area in some little quantity in the junk-yard, and subsequently turned out to be the power-amplifier section of the T-217/GR rig.

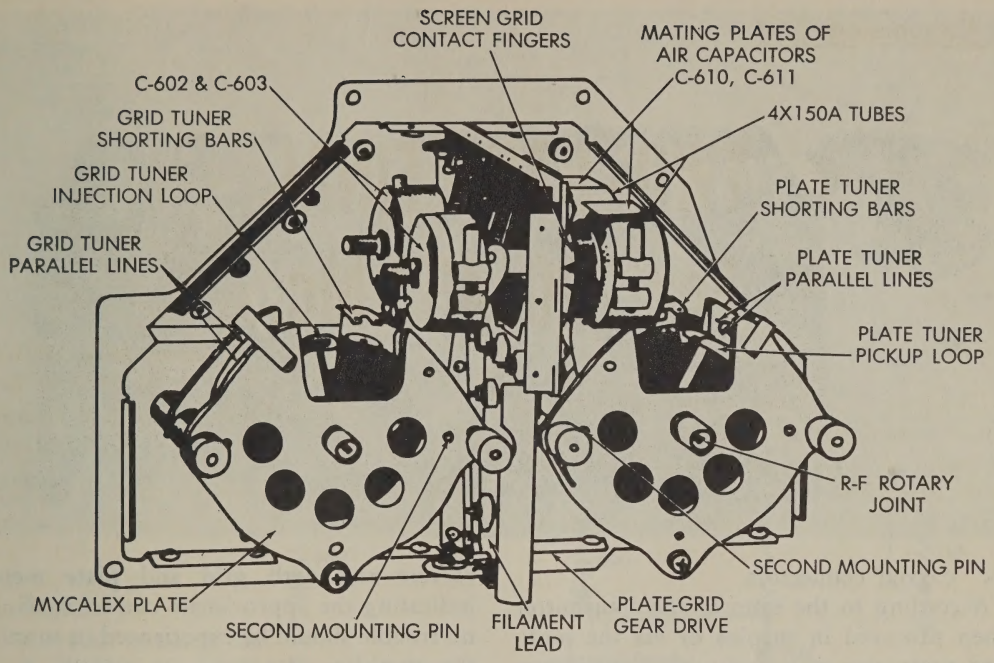
This article will set forth how this power amplifier section may be put to quick use on the 220 and or 432 Mc bands. It will actually be preferable to use it on either 220 Mc or 432 Mc, instead of using it as a two-band job, but it certainly will perform on both frequencies. More on this later.

This P. A. portion of the T-217/GR transmitter will consist of push-pull 4X150A tubes, operating Class "C" with a rated output of 100 watts. It normally covered the familiar frequency range of from 220.0 Mc to 399.9 Mc, as did most of the air to ground communication equipment of the military. Tuning was by a motor driven frequency selector unit. Only minor modifications are required to fit it to our use on either 220 Mc or 432 Mc.

A reference to the photograph will suggest one way to mount this rather odd size thing to a recessed type rack mounting chassis, and means for attaching a blower to cool the tubes. The output is patched through a short length of coaxial cable to an antenna change-over relay which was originally found in the ARC-27 transmitter-receiver, and while the contacts in this unit look rather small, very little loss, if any, was measured when operating the T217/GR amplifier at 100 watts output on 432 Mc. Also no detrimental effect on VSWR was caused by this relay. Should the P. A. be pushed to very much over 100 watts output however, it would be advisable to substitute another relay which would handle more power at this frequency. One advantage of the ARC27 relay is a built in sampling device that enables one to tell when the maximum power is being fed to the transmission line.

This power-amplifier is a plain vanilla tuned grid, tuned plate, push-pull job operating at Class "C." Input to — and output from, the power amplifier employs inductive coupling in both the grid and plate circuits. The actual plate and grid circuits used are tuners of the quarter-wave parallel line type, which are rolled up for convenience of tuning.

The unit is completely enclosed in a box having a transverse partition which separates the grid and plate circuits. The two air system sockets are mounted on this transverse partition and air is blown in the grid compartment to cool the tubes. The parallel lines of the grid and plate circuits (tuners) make up about 300 degrees of a circle. On these circular segments, rides a shorting bar of wiping fingers, which selects a certain length arc to correspond with the frequency of operation. Riding on the shorting bar, is an injection loop on the grid side, and a pickup loop on the plate side. The original schematic of the power



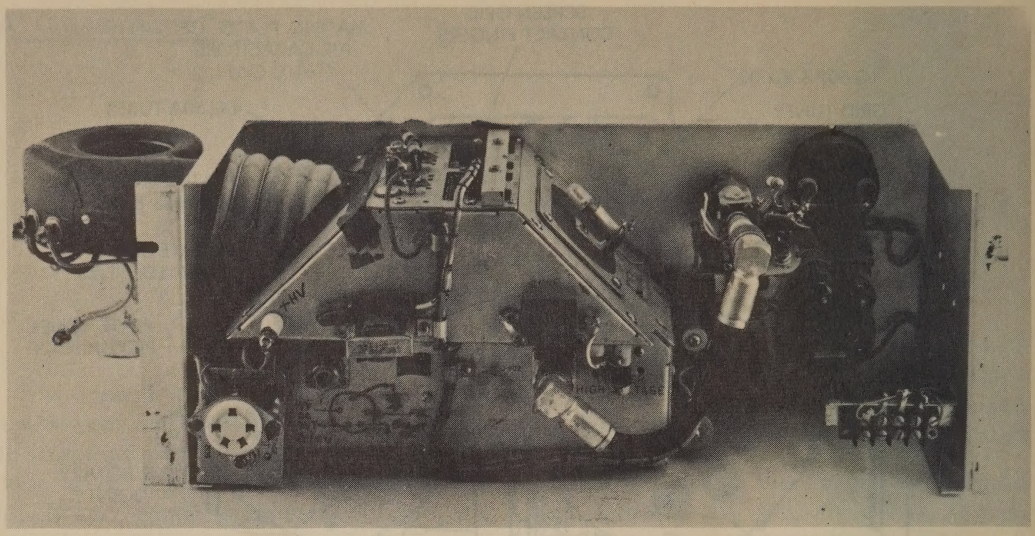
T-2, 7/GR POWER AMPLIFIER WITH SIDE REMOVED
SHOWING DETAILS OF CONSTRUCTION

amplifier section is shown. The T-217A/GR is slightly different from the T-217/GR as regards the screen circuit hookup. Otherwise they are identical.

In case a complete unit was unobtainable, as it was here, the excitation requirements will run about 15 watts on 432 Mc. Using the instruction-book recommended plate voltage of 880 volts, the amplifier is capable of 450 ma, in Class "C," plate modulated service and represents a carrier output of 100 watts minimum. This represents an efficiency of about 35%, which is not too good, really. By operating on one frequency only, (432 Mc) and disconnecting all the ganging — allowing the grid and plate circuits to be tuned individually — and removing the variable disc trimming capacitors (C-610 and C-611) to cut down on the residual capacities of the plate circuit — the efficiency can be increased to at least 40 to 45%, perhaps more, with good tubes. However, should it be desired to use the amplifier at 220 Mc, as well as at 432 Mc, these disc rotors had best be left as is, until such time as it is determined if they are needed to resonate the plate circuit at 220 Mc. It is really asking quite a lot of any amplifier to cover both 220 and 432 Mc and maintain top efficiency at the higher frequency.

The grid voltage is developed across chokes L-601 and L-602. The total grid bias is the sum of -47 volts fixed bias and whatever grid leak bias is developed across R-602 and R-603 by the rectified dc grid current. Normal bias is about -85 volts, corresponding to about 8 ma grid current total (4 ma per tube). The screens are supplied with about 250 to 300 volts d-c through the bleeder composed of R-605, R-606, R-608 and R-609 and are directly bypassed to ground through a sandwich type capacitor. Screen control is provided by means of R-608. A maximum of 300 volts is recommended in the Instruction Book.

The input and output loops which ride the shorting bars allows coupling at low impedance points at all times and these loops are mounted on a special piece of coaxial line, which enters the tuning shafts and leave the power amplifier through rotating joints which are terminated in type



"N" coaxial connectors.

According to the state of the transmitter when procured in surplus or via the junkyard route, one may find various other useful parts. In such cases where rather complete units are found, the amplifier will contain a low pass filter, cutting off around 450 mc, which might be useful. Also one might find the R-F Power Monitor containing two directional couplers serving to indicate power output, and measuring VSWR. Since none of the above were obtained with the writers power amplifier unit, nothing further will be said of them or of any other part of the T-217/GR transmitter — such as the previous multiplier and driver stages. Should you find a unit in poor shape or bashed in generally, most likely the double air-system socket assembly will be in good condition and will be well worth the junk purchase price.

OPERATION

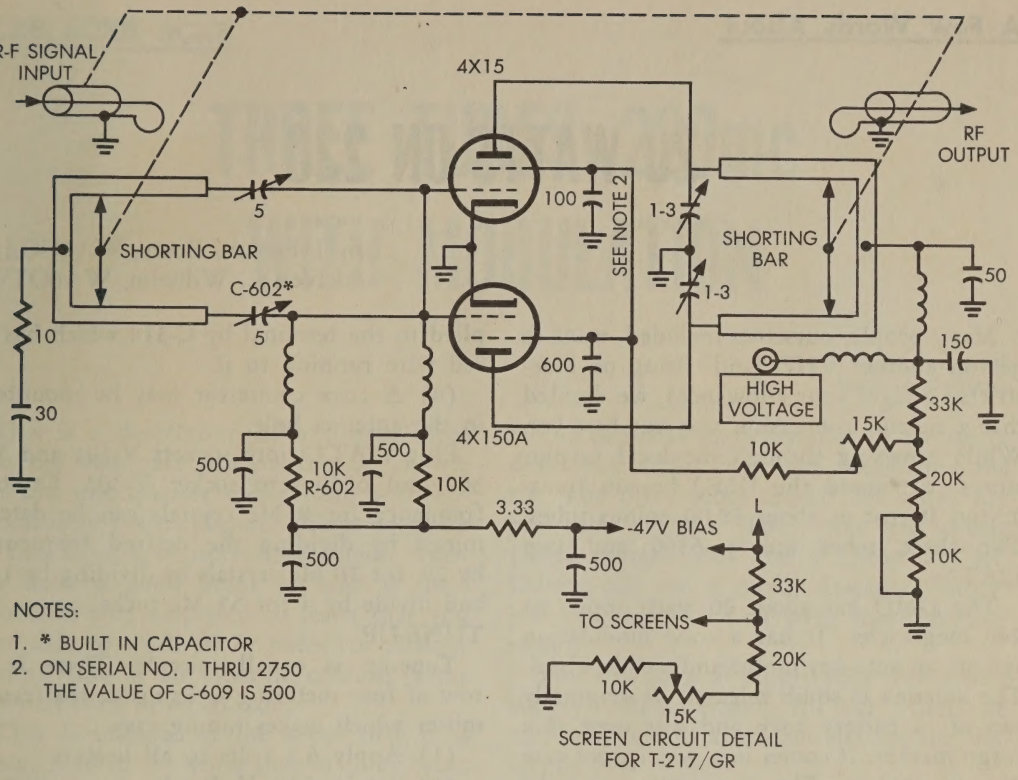
After installing some sort of vernier dials on the front of the panel to tune the input and output tanks of the amplifier, excitation at 432 Mc is coupled in, and the plate current monitored for the usual loaded resonance dip. If a wattmeter good at 450 Mc is available, it would be wise to check the power output against power input and see if the efficiency of the unit is at least 40%.

Checking voltages on the screen and control grids will quickly tell if the drive is correct and with grid and plate meters indicating the approximate correct readings, no trouble should be experienced in running the amplifier.

It will be noted that the effective inductance being used at 432 Mc will be quite small—most of it has been shorted out—and this is the reason for the rather low efficiency. Should the amplifier be used on 220 Mc, the efficiency should be some better, since most of the copper bar tank circuit will effectively be in the circuit. Since other 220 Mc equipment is available at this station, the T-217/GR amplifier was not checked out at the 220 Mc frequency.

Should modulation be desired, it was found that the addition of a small choke coil of a few henries inserted in the screen lead really helped and resulted in good upward modulation.

Referring to the rear-view photograph showing the mounted unit, it may be seen that a pilot lamp mounting is employed. This is merely a lamp loop coupled to the plate tank circuit and adjusted to burn at average brilliance. This old fashioned method is still one of the best ways in the art to determine the modulation characteristics of the amplifier. The blower is seen mounted on the left and blows air into the grid compartment from which point it is forced through the transverse partition as well as the air system socket, and exits through the screen wire openings seen at the top of the plate circuit compartment.



Keying is by the grid-blocking method, and the two regulator tubes visible between the two meters, are connected in series from the screen supply line to ground to hold the screen voltage in bounds as the plate current is cut-off with keying. A very slight back-wave does get through from the input excitation, but it is not objectionable. Probably neutralization would eliminate it, but it was not thought worth the trouble. Besides, you know your signal is getting out very well when the person a couple of hundred miles away can hear the key-up carrier!

The particular way in which the B plus, heater voltage, blower voltage and so on is brough in, is of no concern. This can be arranged to suit your particular needs. For 432 Mc operation, use about 5.5V AC on the heaters, instead of 6.0V. Back-heating seems to occur around 300 Mc or so. It is probably that a very considerable improvement at 432 Mc might be accomplished by removing the circular parrallel lines and replacing them with strictly one band operation sections, such as quarter wave rods in both the grid and plate compartments.

However, for a quick way to get on the air with a little more power than the 50 watt input class, the amplifier section of the T-217/GR will do the job for you on 432 Mc. Actually, it was found to be no trick at all to raise the plate voltage up to 1,000 volts and thus increase the power output to 150 watts and beyond, cw operation. Should SSB ever become common on 432 Mc this unit would work excellently, due to the lower duty cycle. The limiting factor as to power would probably be the wiping fingers shorting the parallel lines in the plate circuit. Class "C" operation would probably heat these up should power be increased too much.

Thanks to fellow-ham AF5QOA for helping us check out the amplifier.

W5AJG

A Few Words About

20 WATTS ON 220

by J. Edward Beezy, WA6UOE,
and Neil C. Wilhelm, WA6OTW

Many people, ourselves included, want to get on another VHF band. Being on a restricted budget (our allowance), we decided that a surplus conversion was our best bet. While browsing through the local surplus stores, we found the DMQ beacon transmitter. It cost us about $8.00, minus tubes. The three tubes are a 6360 and two 12AT7's.

The DMQ has about 20 watts input on 240 megacycles. It has a tone modulation system, an auto-key motor and a code wheel. The antenna is squib released. It originally ran off a battery pack and was used as a cargo marker. It comes in a waterproof case 4" x 4" x 11⅜". The transmitter can be used inside or outside of the case.

The conversion consists mainly of removing the unneeded tone modulation system and changing the oscillator frequency. We installed a coax connector in the hole left by the removal of the antenna.

CONVERSION

Remove the unit from its case. Take out the squib mechanism and the antenna. Remove the keying motor next. (It can later be used as a keyer on transmitter hunts.) Disconnect all leads to pins 6, 7, and 8 of V-302, and then remove the tone modulator transformer.

Make the following modifications:

(1) Connect a 7.5 picofarad ceramic capacitor from the stator terminal to the rotor terminal of C-302.

(2) Disconnect the B+ lead from the feedthrough near V-303 and reconnect it to the binding post near pin No. 5. Modulated 300 v. may be applied there in operation.

(3) Driver voltage (300 v.) may be applied to the terminal by C-314 which has a red wire running to it.

(4) A coax connector may be mounted in the antenna hole.

Plug 12AT7's into sockets V-301 and V-302 and 6360 into socket V-303. Crystal frequency for 8 Mc crystals can be determined by dividing the desired frequency by 28, for 16 Mc crystals by dividing by 14, and divide by 4 for 55 Mc rocks.

TUNE-UP

Tune-up is equally simple. There is a row of four metering jacks inside the transmitter which makes tuning easy.

(1) Apply 6.3 volts to all heaters.

(2) Apply 300 V B plus to oscillator and driver, V-301 and V-302.

(3) Plug the negative probe of a high resistance voltmeter of V.T.V.M. into meter jack No. 1. Adjust C-302 for maximum voltage.

(4) Insert the probe into jack No. 2 and adjust C-302 and C-307 for maximum voltage.

(5) With the plug in jack No. 3, tune for maximum voltage with C-302, C-307, and C-310.

(6) Metering jack four, tune for maximum voltage with C-302, C-307, C-310, and C-313.

(7) Connect a No. 44 pilot lamp across coax connector. Use short leads.

(8) Apply 300 V unmodulated B-plus to the final. Adjust C-314 and C-317 for maximum brilliance of the light bulb. If you use a milliamp meter in the B-plus line, dip the current to about 60 Ma.

(9) Ten watts of audio is required for AM. The pilot lamp should brighten when modulation is applied.

THREE TUBES - 220mc WITH MODULATION

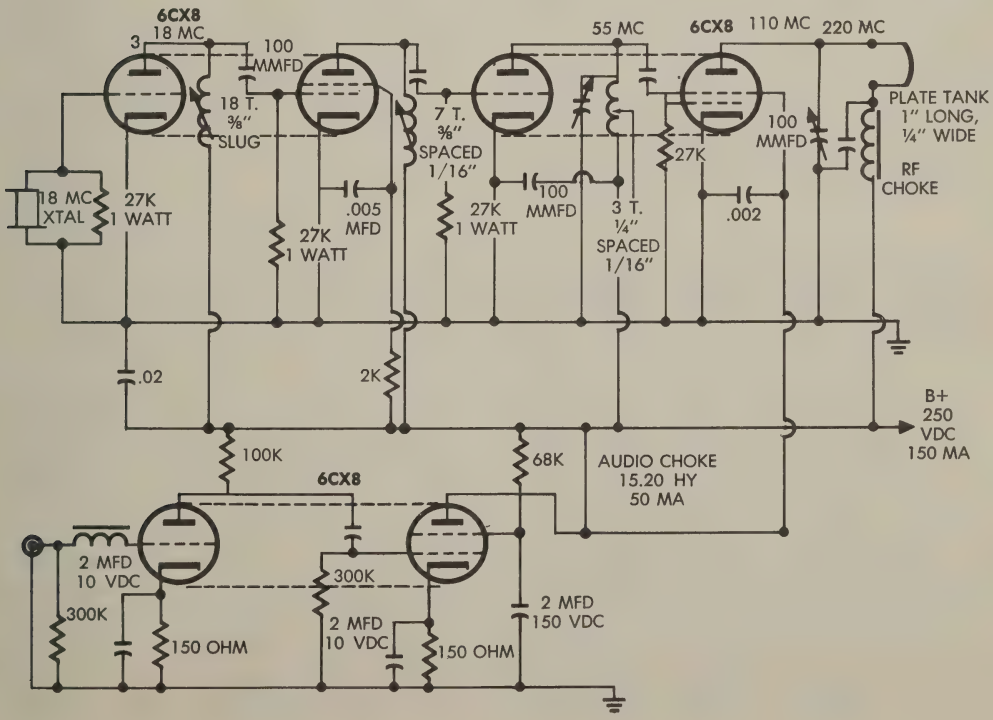
Ray Fulton, K6BP
Manteca, California

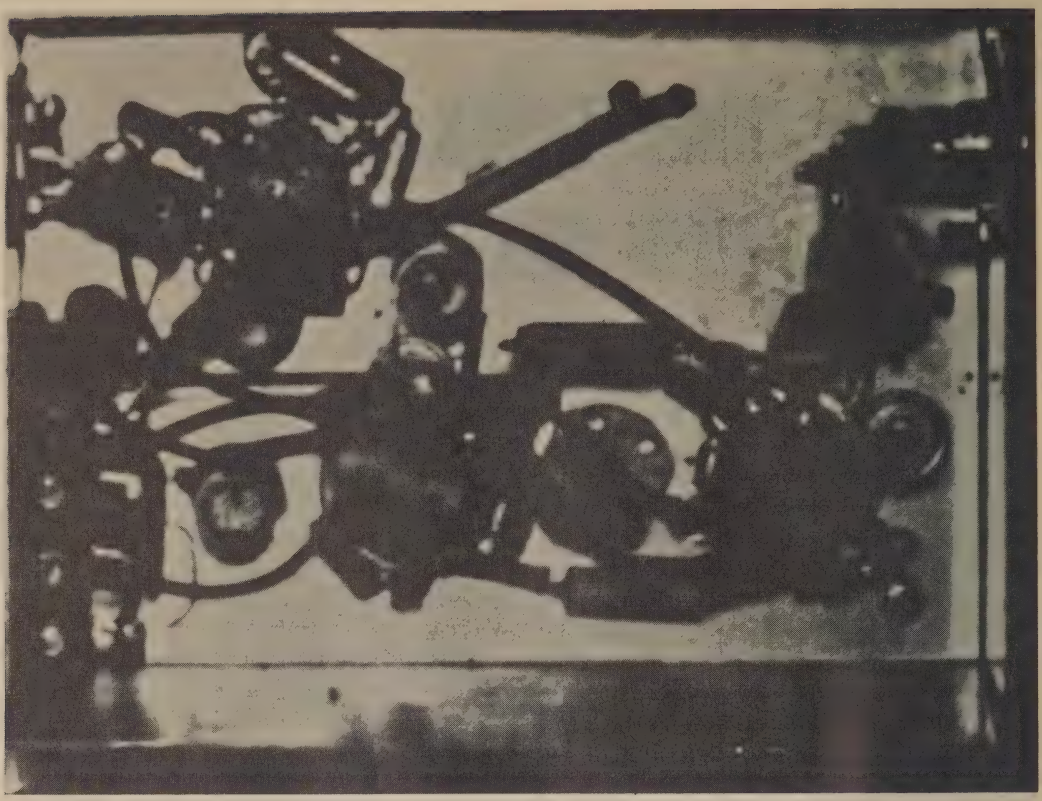
This is a description of a simple three tube rig that puts you on the air on the one and one quarter meter band with approximately 1 watt output. This is adequate on this amazingly noise free region when you have a good beam to load it into. I shouldn't be surprised to learn that you were able to work 50-75 miles consistently loading into a 16 element colinear array or an antenna of equal gain.

This is unusual in the sense that it is cheap. And in the sense that in three tubes we have taken our RF from 18 megacycles (using cheap 18 mc/s crystals) to 220 mc/s, developed audio and fully modulated the rig. The three tubes are all the same. My pets, the 6CX8's. They, too, are cheap. (Some people call me a cheap builder. Others call me a cheap designer. Others just call me . . . . oh well, that's another story.)

You will have to supply your own power supply. Requirement is 250 volts, at 150 ma., as well as the 6 volts for the filaments.

Now those of you who have seen how





the 6CX8 has been adulterated in 27 mc equipment of another radio service know that this tube is capable of at least 5 watts in down there, and in many cases twice that amount.

At 144 mc the maximum suds rating drops. By 220 mc we shouldn't push more than 3.5 watts to the poor little old 6CX8, if we want it to hang in there very long.

SO . . .

The crystal is a tripler type on 18.475 mc/s. The first plate circuit is tuned to this frequency and the oscillator is completed.

Output from the oscillator is coupled through the 100 mfd condenser to the grid of the pentode section of the first 6CX8. The oscillator is the triode section, of course. This grid, as well as all of the rest in the transmitter, are grounded through 27K resistors. Diode bias is sufficient to protect the tubes as long as the oscillator is working.

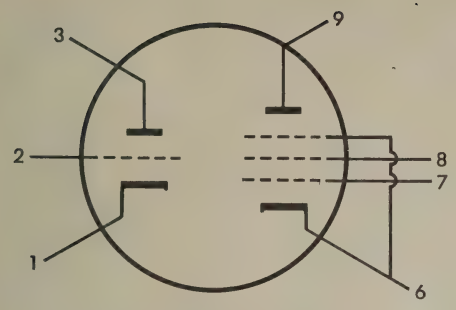
This gives us 55 mc/s output at the plate circuit of the pentode section of the first 6CX8. Coupling to the grid of the triode section of the second 6CX8, we end up with 110 mc/s in a frequency doubler, going to the grid of the pentode section of the 2nd 6CX8. This means we are doubling in the final, and last pentode stage, to 220 mc/s, plus whatever the crystal has us above this point.

I advise that you use ceramic sockets for the two 6CX8's in the rf deck because you don't have enough power to waste it on anything with higher loss than ceramic. Teflon would be best, but then we are beginning to defeat our "cheap" approach.

Now about the modulation. There's audio on the screen grid of the pentode stage of the final, so that makes it screen grid modulation. However, there is also audio applied to the plate circuit through an audio choke-r.f. choke combination, so this makes it Heising modulation.

Whatever it is, I know from building up dozens of similar low power rigs for six and two meters that there is lots of audio with good quality and punch, and it's **cheap!**

Most of the coils should be obvious and if you follow directions, there should be no



6CX8 TUBE BASE DIAGRAM
(PINS 4 AND 5 ARE HEATER CONNECTIONS)

trouble. What you are doing building a rig for 220 mc/s without access to a grid dipper, I don't know.

The final tank circuit consists of a hairpin loop (oh shades of QST!) made up from a piece of number 16 silver plated wire. Most surplus units had an excess of this kind of wire. The antenna link is made of the same stuff, the same way. See the schematic for dimensions.

A word of caution. Watch how you place your by-passes. We moved a few around just ½ inch and output dropped in half.

The final tank hairpin is supported just on the condenser end. The Z220 RF choke (or equal) goes to a small stand off insulator from the other end of the tank loop.

During tune-up, start off with around 150 volts and get the oscillator going first. Then you won't have to worry about losing the final tube due to lack of drive or bias.

With noise what it is on 220 (or perhaps we should say "what it isn't") this rig would make a very good small and compact low cost unit for a mobile. Mobile to base links on this band are really something that's worth exploring. If you have tired of fighting ignition on six, or to a lesser degree on two, 220 will be a real welcome adventure. With the amount of disgusting inactivity in most areas on 220, this rig would also make an excellent production line club project to get a half dozen or more fellows transmitting on the band for local rag chews and liason nets.

The receiver is no problem. Simply find a discarded TV tuner, run the channel 13 slug in, or spread the two turn coil on the channel 13 form, until you grid dip out at 220. If you have a discarded tuner with a 21 mc/s i.f. strip, you can use your 15 meter band for the i.f., or a general coverage receiver to do the same thing. This is also a very cheap way of listening on 220.

If the tuner is a 45 mc/s version, remove a turn from the oscillator and make it come out on 50 mc/s. Then you will be using six meters as your i.f.

What ever the case, there is no excuse for not being on 220. This rig will cost you around $5.00 and about two evenings time.

What better way to while away the hours when you're waiting for six to open?

W6NLZ, K6EDX Team Up On . . .

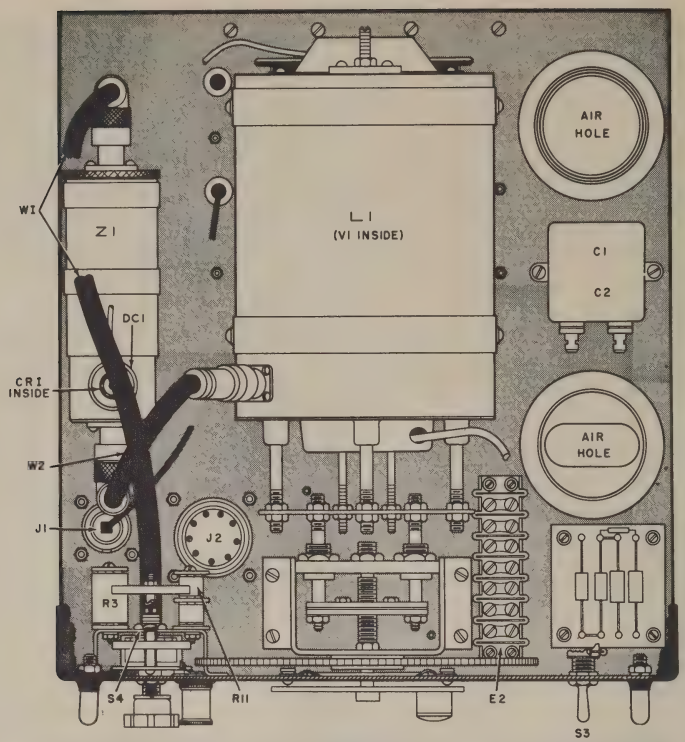
PUTTING THE TRA 19 ON 220

John Chambers, W6NLZ/A6NLZ
&
Bob Cooper, Jr., W5KHT
% VHF Horizons Magazine

Recently, John Chambers, staff research consultant and amateur W6NLZ contributed a short two page piece of converting an Army-Airforce power amplifier unit AN/TRA-19 (with matching power supply) to the 220 megacycle band.

Since I, W5KHT, had been looking for an inexpensive means of landing on 220.05 with a moderate amount of signal (they tell me there has never been any one on 220 in this state — I find this hard to believe), I set the wheels in motion to obtain one said piece of gear.

In a sense then, this is a description of W6NLZ's conversion description, and a report on how I found it to work out in actual practice, plus a keying and class C switching circuit which I added.



Spider assembly is visible in lower center. Grid tuning plunger is in absolute center of assembly.

The AN/TRA-19 is one of those innominate numbers that means nothing except to its mother. In this case it is an Airforce-Army unit designed for field radio telephone terminal use (in the case of the Army). It features a beautiful coaxial tank with a 4X150, complete matching power supply (830 vdc is top plate voltage), a directional coupler in the output, a low pass filter (good for UHF TVI problems), in two separate packages that hook together through an all too short multi-wire power plug.

The 4X150 is force air cooled by two of the huskiest blowers you would ever care to find, and the entire unit is approximately 1955 in vintage.

Following W6NLZ's conversion suggestions, we landed on 220.050 (which is as low as you will probably want to go) with no trouble. The unit, as it stands, tunes 230 to 250 megacycles. The grid and plate lines have sufficient play, (as we will discuss shortly), however, to put you down even on the low end of 220.

A straight conversion, ala W6NLZ, netted me 120 watts output in Class C for 180 watts input. This is about as good as one could expect.

Changing over to a 4CX250B netted me another few watts output. This is a very healthy amount on this band.

Here are W6NLZ's conversion instructions. The added material are my comments on how close John was to the money, in my case.

"(1) The minimum change (and this will probably work) is as follows. At the end of the cavity (where the tuning mechanism is), you will note a spider assembly (a triangular metal plate) which connects to the tuning shafts. In the center of the spider is a small serrated plastic wheel about $\frac{5}{8}$ inch in diameter. Turn this wheel clockwise to lower the frequency of the grid tuning circuit. With 5-10 watts of grid drive on 220 Mc applied, through the front panel input connector, turn this wheel clockwise to maximum grid current, which is indicated on position 6 of the multi-purpose meter on the final.

(2) At the end of the tube cavity is a $\frac{1}{4}$-20 screw with a hex jam nut. This is your plate trim. Running the screw in (after loosening the jam nut) lowers the frequency. This combined with step one **should** put you

TRA-19 at W5KHT. No outside changes are apparent. Power supply has been rack mounted below final. Drive is supplied by Communicator IV.

in the band. (W5KHT note: John is correct, it got us down to 224 megacycles with our unit. How to get to 220 is covered next, however).

(3) If steps one and two won't get you down low enough in the band, it will be necessary to loosen all of the nuts on the spider end of the three tuning rods on the outside edges of the spider, push the rods in towards the cavity removing them from the spider assembly. All three move together, so you can grasp the top one and with grid drive applied and peaked, slowly move the three rods in until you get an indication of output on your frequency. Maximum length inside the cavity is maximum inductance, and hence lower frequency.

(4) At this point go back to the plate trim on the rear of the cavity and use it to fine-tune your setting with the plate tuning rods.

AM LINEAR

John adds "As it comes, it is a class C device and on the air it sounds like a class C non-linear amplifier, or pretty bad (as you would expect a class C stage to when run as a linear). Assuming the RF circuitry has been re-adjusted to hit 220, the following steps will improve the output and linearity for AM Linear operation.

The screen voltage is too low and the grid bias is too high.

To raise the screen voltage, replace V-106 (the 5651) in the matching power supply with an OB2 and turn screen voltage adjustment potentionmeter R-112 for maximum voltage, up to 350 volts. You probably won't get much over 320 volts, but this should suffice.

To lower the grid bias: Connect a Zenar diode, such as a Motorola 1N3037B from terminal K to terminal L on terminal strip E-101. Be sure to connect the cathode end of the diode to terminal K. This will give you 51 volts, regulated.

It's now ready to tune up. Run your drive up to where it's barely perceptable on meter (½ ma) — dip the final — and that's it; you're all set. More grid drive gives more output, but most of the increased output is distortion. Don't use it on AM phone this way.

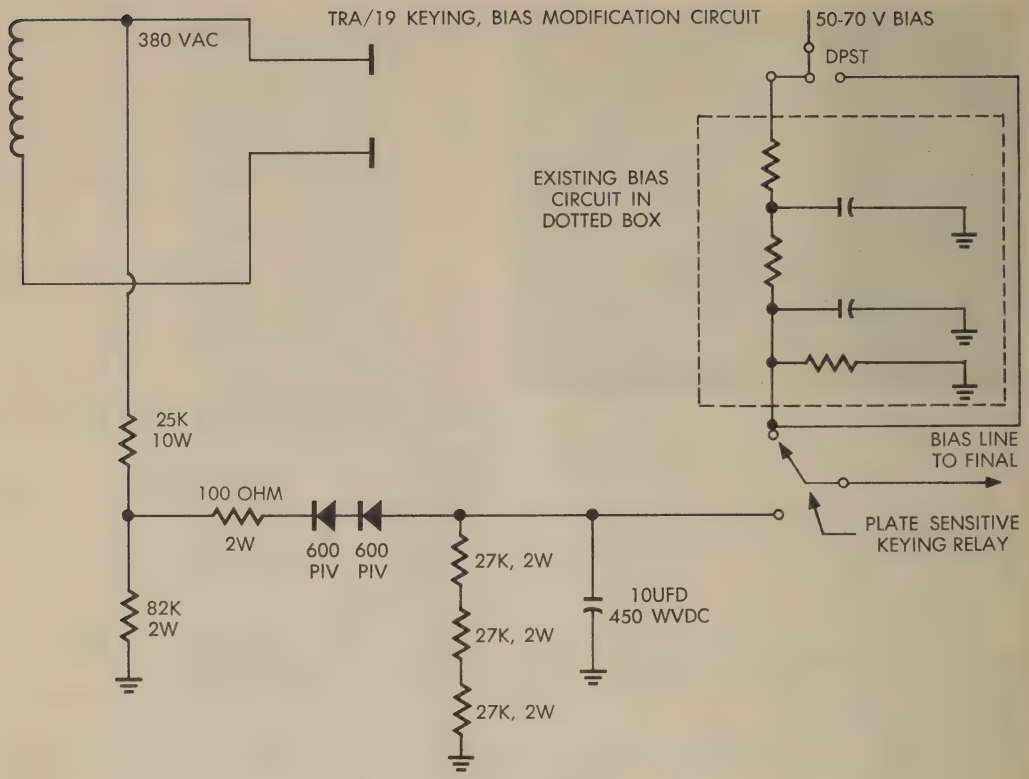
For FM or CW, full rated grid current is desirable. This is a fine device, and it will add a real punch to your transmitter on 220 mc. See you there! (I hang out around 221.6 Mc/s)."

In our case, at W5KHT, we had no desire to run it Class anything but C, so we left the screen voltage alone and **raised** the grid bias from its rated 70 volts to 100 volts by running around the bias dropping network as shown in schematic 1. The switch lets us run the regular bias through the unit or the increased bias.

To key the 4X150 (or 4CX250), we came off the 380 volt AC winding on the power transformer with the network shown in schematic 1. This developed 220 volts of bias which with the key up cut off the final very nicely. With the key down the normal Class C bias prevailed. We keyed with a plate sensitive relay running the primary winding of same through a 45 volt B battery.

This leaves the driver running, which is not really objectionable on 220. Since fast break-in is seldom if ever required, this works very well.

One final word about our unit. It was a **new** surplus unit. Apparently it had never been in service. The 4X150A was shorted nicely which required a bit of circuit tracing. The circuit breakers on the power supply operate a 40 second time delay motor driven relay (K101) which allows the unit to warm up before B plus is applied. Any short in the amplifier or power supply will cause the motor driven relay to shut down the AC to the unit at the end of 40 seconds.



In our case the short was the 4X150A, which was quickly located by removing the B plus line to the final and waiting to see if the circuit breaker gave up again.

Now we have Oklahoma on the 220 map, look for us on 220.050 when the band looks good. We run the "CQ-CQ de W5KHT" keyer when two meters looks like 220 should be open, and load a 32 element colinear array 50 feet up. —30—

Fancy No. For 417A

CK-5842 TWO METER CONVERTER

Here is a two-meter converter that is "hot" in performance, inexpensive and easy to build. The converter utilizes four tubes: CK-5842 1st RF, 6AK5 2nd RF, 6J6 oscillator-tripler and 6AK5 mixer.

The CK-5842 is the Raytheon version of the ever popular 417A and provides excellent performance while being moderate in cost: $7.40 each (Allied Radio Catalog for 1963).

By L. F. Kiner—K6VNT
17800 Blythe Street
Reseda, California

The circuit, shown in figure 1, is straight forward and employs double tuned stages to maximum image rejection (which turned out to be nil in the original unit). The CK-5842 is used in grounded grid type operation. B+ of 150V at 20 ma is required to

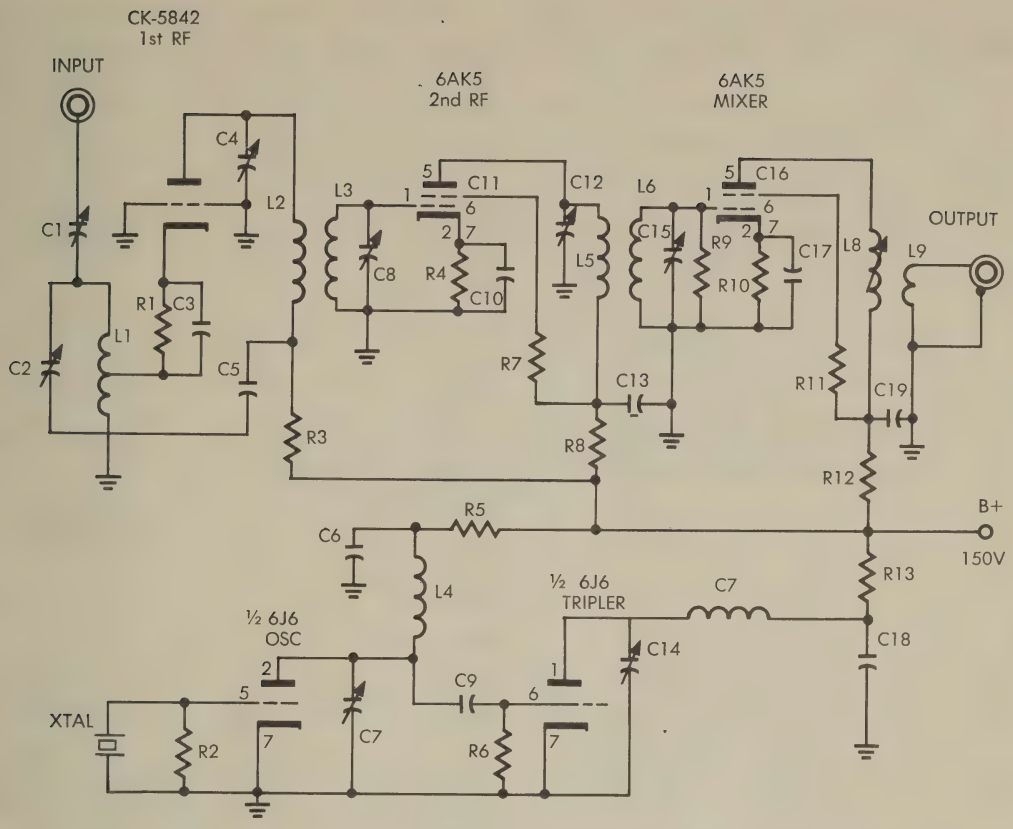


FIGURE 2

SCHEMATIC CK-5842 TWO METER CONVERTER. PARTS LIST, PAGE 32

operate the converter. Power may be "borrowed" from the receiver, however it is recommended that a separate power supply be used — preferably well-regulated.

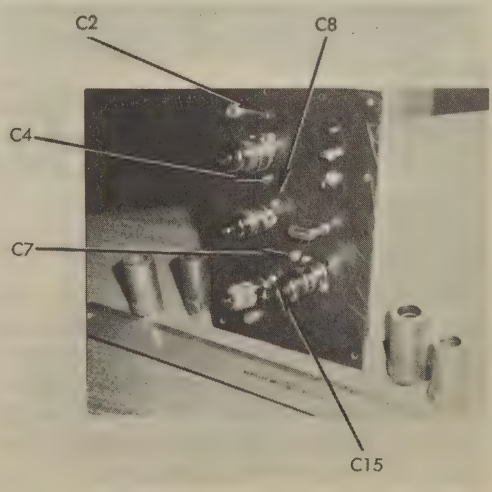
COILS

All the coils except L8 and L9 are made from number 18 tinned wire. No. 20 or 22 would probably work just as well, however.

To provide yourself with some coil stock, take about a foot or two of tinned wire and wind it tightly around a length of ½" wooden dowel or other suitable device. This will supply all the ½" coil stock you'll probably ever need and most certainly enough for use in this converter.

CONSTRUCTION

The original unit was built on a piece of single-sided copper-clad paper-base printed circuit stock. Using printed circuit board stock makes for easy ground soldering and shield installation. It is recommended that epoxy-base material be used instead of the paper-base material (phenolic). The paper-base cracks easily (as we found out) and requires great care. Conventional tube sockets are used — drill ap-



proximately ¼" pilot holes for the tube sockets and carefully ream larger to the required size.

The printed circuit board is ⅛" thick material cut 4" x 6" and is mounted on a 4 x 6 aluminum chaissis in the same manner that you would a bottom plate. Be sure to allow sufficient room around the edge of the board to allow for the chassis mounting flange.

Line up the CK-5842 and two 6AK5 along the 6" length as close together as possible and place the 6J6 as close to the last 6AK5 as you can. This will provide close coupling between stages. Take care when installing the shields and coils to avoid shorts.

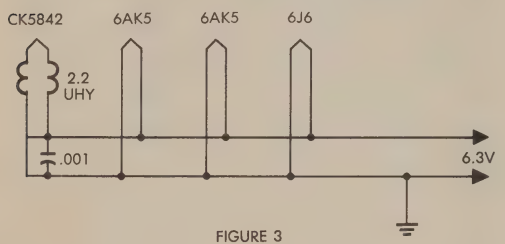


FIGURE 3

Use your grid-dip meter for preliminary coil adjustments before applying power. The grid dipper is again used after power is applied to verify the preliminary adjustments and perform any peaking required. Be sure the oscillator takes right off. The ARRL Handbook describes this procedure quite thoroughly in the chapter on VHF receivers.

After the above adjustments have been made, connect the CK-5842 converter to the receiver. Final adjustments and peaking are best made with "on the air" signals. Peak the capacitors for maximum signal. Compressing and/or expanding the coupling coils may also be necessary — use an insulated alignment tool for this and be careful that the coils do not short across B+.

If it is desired to use a different IF frequency, it will be necessary to change the crystal frequency and add a few turns to coils L4, L7 and L9.

The crystal frequency is calculated by using this formula:

$$\text{Xtal Freq} = \frac{(144) - (\text{IF Freq})}{3}$$

Example:

$$\text{Xtal Freq} = \frac{(144) - (14)}{3} = \frac{130}{3} = \frac{43.3333 \text{ mcs.}}{3}$$

The original unit was designed to work into a 30-mc IF strip as provided in the NC-300, NC-303 and similar receivers.

If it is desired to use a different IF frequency, it will be necessary to change the crystal frequency and add a few turns to coils L4, L7 and L9.

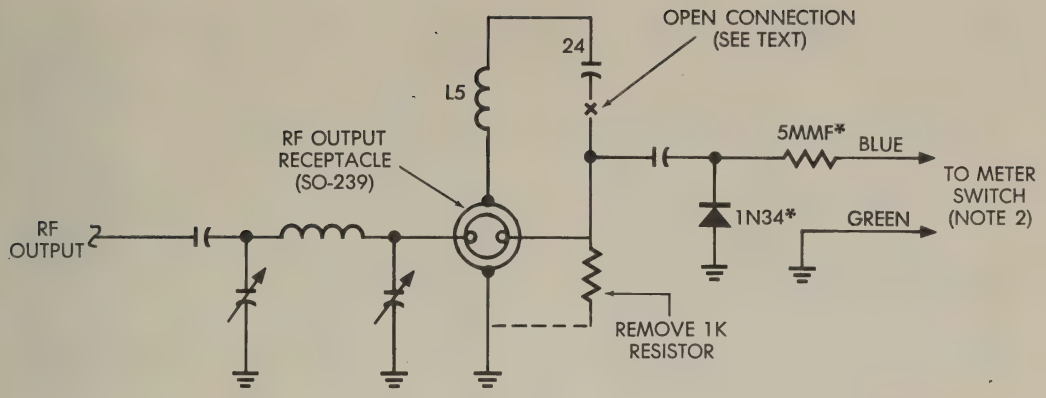
The IF frequency inserted in the above formula is the low end of the I.F. The above crystal, 43.3333 mcs, will result in your converter output being 14-18 mcs.

Good Project

IMPROVING LAFAYETTE'S HE-45

Fred Blechman, K6UGT
Canoga Park, Caliofrnia

The Lafayette HE-45A 6-Meter Transceiver **(Lafayette Radio, 111 Jericho Turnpike, Syosset, L.I., N.Y.)**, has a list of features a yard long, among them a sharp-tuning superheterodyne receiver with RF stage, variable noise limiter, illuminated tuning dial and "S" meter, crystal switching, built-in 117 and 12 volt power supplies, push-to-talk, 12 watt input final and pi-tuning output. Supplied with an 8354 kc crystal (50.124 mc output), power cables for both 117 and 12 volts, and a pushbutton ceramic microphone (with coiled cord), it's quite a package for $114.95!



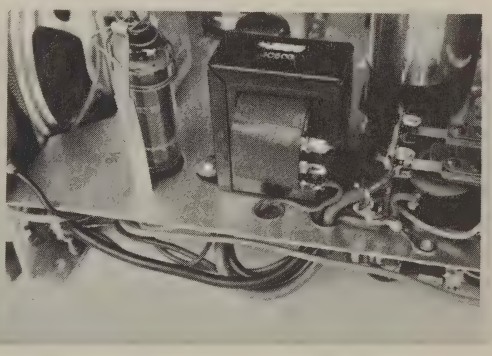
NOTES: 1. NEW PARTS MARKED *
2. METER SHUNT (EXTERNAL .56 OHM RESISTOR) MUST BE REMOVED, AND BLUE & GREEN WIRES FROM METER SWITCH REWIRED AS DESCRIBED IN TEXT.

FIGURE 2
RF OUTPUT METER CIRCUIT

However, like a lot of hams, I'm never quite satisfied with a piece of gear I didn't design myself, so my HE-45A now sports a number of modifications which (despite their simplicity) contribute a great deal to ease of operation and efficiency. **I upped the modulation to about 95%,** simplified transmitter tuneup, increased transmitter output, provided alternate manual switching for the built-in push-to-talk, and "bandspread" the receiver. **These modifications are readily applied to other similar rigs;** most of the modifications apply directly to the earlier model of the HE-45A, the HE-45.

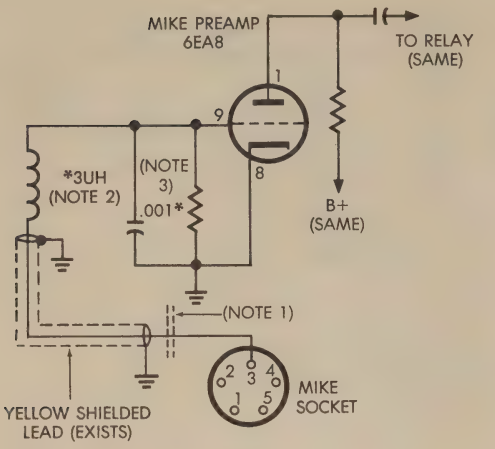
"Souping Up" The Modulation

My HE-45A, as received, only had a transmitter modulation percentage of 35%. I understand this is common among HE-45A's. Any attempt to "hit the mike harder" only resulted in distortion, without increasing the modulation percentage. After several unsuccessful attempts to correct this condition, I followed a "lead" and contacted Ron (WA6UNM) and Bud (WA6UEF) at Marina Communications, a Los Angeles outfit with lots of Citizens Band experience. They had been successful in improving the modulation percentage on some Lafayette HE-20's, the CB older brother of the HE-45A. Marina has a special modulation transformer with better iron (and more of it) than the transformer in the HE45A, yet has the same mounting dimensions. Using their transformer, and making some other minor changes, Ron **doubled** the modulation percentage, to about 70%! This pleased me for awhile, but everytime someone reported "you could still use some more modulation," I'd dive into my reference books looking for clues. Finally, one roll of solder later, it turned out all I had to do was move a couple of wires, and add a resistor and an electrolytic capacitor to get 95% of "clean" modulation! The effort to do this is so simple (in retrospect) that is is inexcusable not to do it.



The Buddy MC-500 modulation transformer replaces the modulation-output transformer in the HE-45A. Note the lugs on the "output side" of the transformer.

FIGURE 1B
OPTIONAL MODULATION CHANGES



NOTES:

1. REMOVE .001 (.0001 IN SOME UNITS) CAPACITOR & WIRE DIRECTLY TO PIN 3 OF MIKE SOCKET
2. REMOVE 100K RESISTOR & REPLACE WITH 3 MICROHENRY CHOKE (SEE TEXT).
3. REPLACES 100 MMFD.
4. CHANGED PARTS MARKED *

Figure 1 shows the revised circuitry associated with the modulation. All you do is drill or punch out the rivets holding the existing modulation-output transformer to the chassis and replace it with the Buddy MC-500 **(available only from Marina Communications, 11527 W. Washington Blvd., Los Angeles, California for $4.95, postpaid).** The new transformer is screwed to the chassis using the same mounting holes. Feed the leads through the hole in the chassis. The blue transformer lead connects (don't solder yet) to the 6AQ5 pin 5 socket lug; the red lead is not used (tape and stow); and the brown lead is soldered to where the old white lead was connected (B-plus). Now unsolder the modulator lead (blue shielded wire) from the terminal strip end lug (where it formerly connected with the old blue transformer lead) and solder it to the 6AQ5 pin 5 lug, together with the new blue transformer lead. Use a jumper if it won't reach. Now follow the blue shielded modulator lead to its other end, where it joins with a 5.6 ohm resistor and a blue wire at a terminal strip. Remove the plain blue wire and let it hang free; we'll get back to it later. Remove the 5.6 ohm resistor (it is no longer needed for the meter shunt, since we'll be changing the metering circuit a little further on). Now unsolder the screen resistor (12K 2W in late models) from this modulator lead terminal lug, and move it over two lugs to the end of the strip, where it joins an orange wire coming through the chassis. You will also find a green wire on this lug; remove this green wire and solder it to any nearby ground. (This is a meter lead, which we'll get to later). Now solder a 470 ohm 1 watt resistor and a 10 mfd 150 volt electrolytic capacitor in parallel between the modulator lead and the screen resistor at the terminal strip lugs.

Back to the new transformer. You'll find three lugs for the speaker winding. Run a lead from the upper lug to the upper relay contact, as previously used with the original transformer. Run another lead from the **bottom** transformer lug (the middle lug is not used) to pin 5 of the microphone socket, where it will join with the orange wire going to the speaker.

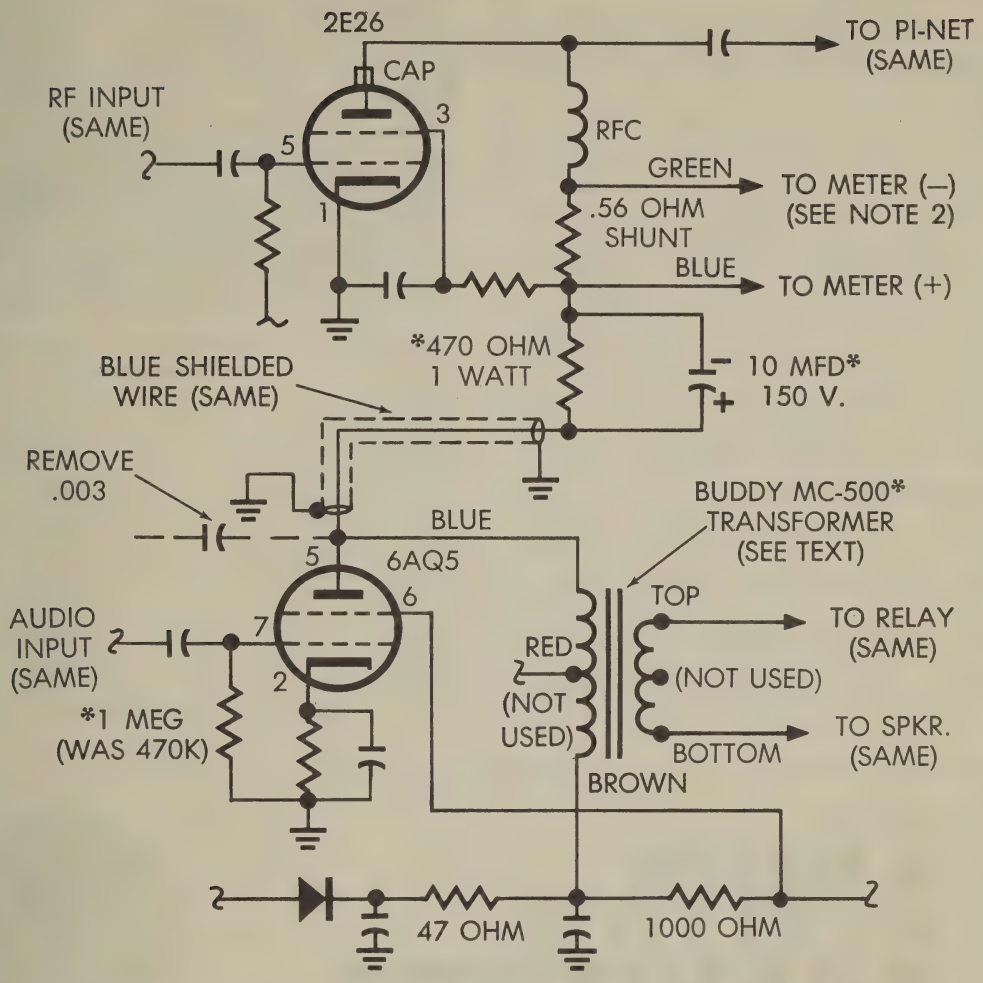
The following additional changes will insure good modulation, but may not be required on all units. At the 6EA8 socket (V4-B) change the 100 mmf capacitor to .001, and change the 100K resistor to a 3 microhenry RF choke. (You can make this choke by winding 32 turns of No. 32 enameled wire on the 100K resistor). At the microphone socket, remove the .0001 mfd capacitor (.001 in older units) and run the yellow shielded wire directly to pin 3. At the 6AQ5 socket, change the 470K resistor at pin 1 to 1 megohm. These changes are shown in Figures 1A and 1B.

Now, don't try things out until you've finished the wiring for the . . .

RF Output Meter

The panel meter, as furnished, is switched between use as an "S" meter and a final-plate-current meter. However, you are more interested in knowing that you are getting maximum RF output than you are in knowing the plate current. Changing the metering circuit is very simple, and will make tuneup much quicker and more meaningful.

FIGURE 1A
MODULATION MODIFICATIONS



NOTES: 1. NEW OR CHANGED COMPONENTS MARKED*.
2. METER SHUNT IS REMOVED TO CHANGE METER TO READ RF OUTPUT (SEE TEXT & FIGURE 2)

Remember the blue lead we left hanging in the breeze a few paragraphs back? Well, solder an 18K ½ watt resistor to its end; the other end of the resistor is wired to a diode and capacitor as shown in Figure 2. There's plenty of room around the coax receptacle for these small parts. Notice that the green wire has already been soldered to ground, if you were following previous instructions! Also, the 1K resistor is removed and discarded, and the rather ineffective and power-wasting "TV Trap" is disconnected. Use a Drake TV-100-LP low-pass filter on the back of the rig instead; it's more effective, with practically no power loss. The built-in TV Trap reduces the the power output by almost ¾ watt if left connected!

Now, in the "Ip" position of the meter switch, the meter will read relative RF output voltage. It will read different maxima with different antennas, since it will be at a different spot on the almost inevitable transmission line voltage standing wave; the important thing is to tune for minimum with whatever load you are using.

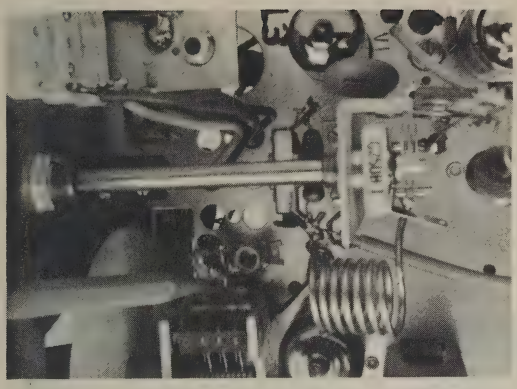
Panel Antenna Tuning

For reasons best known to the manufacturer, the antenna tuning control (pi-network output capacitor C2) is tuned through a hole in the front panel. The shaft of this capacitor extends to less than an inch of the front panel, so I simply added a shaft coupler, a short 1/4 inch diameter shaft and and knob, as shown in Figure 3A. The capacitor shaft is smaller than the hole on the coupler, but sliding some "spaghetti" sleeving on the shaft builds up the diameter sufficiently. You'll probably have to partially unscrew the front panel to allow you to get the coupler on the shaft. Then insert the new shaft through the front panel into the coupler, tighten the setscrews, add the knob, and you have front panel tuning.

Receiver Modifications

Now let's turn our attention to the receiver section. I didn't do too much here, since not much seems necessary. The receiver is very sharp tuning, has excellent sensitivity, and doesn't drift enough to bother most operators. However, after making the transformer change described, it was found necessary to add a .005 ceramic disc capacitor from the center lug of the volume control to ground, to discourage an audio feedback tendency on loud signals. This also bypasses a lot of annoying high-frequency noise.

Next, the receiver was electrically "bandspread." It bothers me to see a receiver tuning 50 to 54 megacycles when only 50.1 to 51.5 mc is actively used for phone contacts in most areas. By adding a 10 mmf silver-mica capacitor in series with the existing variable tuning capacitor, the receiver tunes about 1½ megacycles. To do this, you must move the wire between the bottom of the ceramic slug-tuned coil L4 and the stator of the tuning capacitor. Disconnect the tuning capacitor end, pull it through the chassis hole and solder a 2-inch insulated wire to it. Run this through the chassis hole near slug-tuned capacitor C4. Unsolder the tab on C4 from the tuning capacitor stator and turn the whole sleeve about 90 degrees clockwise. Leave the N330 15mmf capacitor soldered to the C4 tab. Solder the new wire from under the chassis



The "bandspread capacitor" is tucked in between the variable panel-tuning capacitor and trimmer C4.

to this point, and add the new 10 mmf silver mica bandspread capacitor from this tab to the tuning capacitor stator terminal. Now retune L4 for 50.124 megacycles at 50 on the dial, using the crystal furnished with the HE-45A, the spot switch and the S-meter. 51 megacycles will now be received at about 53 on the receiver dial. Using other crystals you can make up a calibration chart. Wait until the unit is well warmed up before calibrating.

Now, as you tune across the band, you will be less likely to pass over a signal, and when you tune, it won't be so "touchy." Also, with the calibration curve you have a better idea of your receiver frequency, since the markings are "spread out." You can mark special frequencies (net, repeater, club, etc.) on the dial with a pencil.

Some Other Pointers

While we're at it, here are some other things an HE-45A owner should know about:

(1) If the transmitter breaks into oscillation when turned on, retune the oscillator slug. Also, a 10 mmf capacitor couples the transmitter output to block the receiver; move this away from either of the tubes near which it passes.

(2) If your case doesn't have a microphone bracket (it was left off my unit), you can get one at any ham or CB dealer for about 35 cents.

(3) The only set-screw knob used on the HE-45A (RF Peaking) doesn't have a brass insert, so it's easy to strip the set-screw threads. If this happens, you can drill and tap another spot on the knob for the set-screw, or change to a better knob. Filing a flat section on the RF Peaking control shaft will help prevent this trouble.

(4) If you decide not to change the "Ip" meter wiring to read RF Output, as already described, don't worry about the meter readings for Ip being lower than the value mentioned in the instructions. The value of the shunt used here (.56 ohms) is very critical; on my unit 100 ma on the meter was actually 130 milliamps. On tuneup my meter only read 46 ma., although 60 ma. was flowing.

(5) As already mentioned, the "TV Trap" shunts almost a watt of RF output power, and is not a very effective TVI filter. Disconnect it and screw a Drake TV-100-LP on the back of the HE45A. You'll be way ahead in output, way down in TVI.

(6) Don't depend on your HE-45A voltage being within 20% of the tabulation in the instructions. More than half of mine were off more than 20%, yet the rig works fine! There's a lot of RF being fed to the receiver on transmit, and the effect varies from unit to unit, and from voltmeter to voltmeter. When receiving, the transmitter section is cut off by a biasing network, which has a broad tolerance effect.

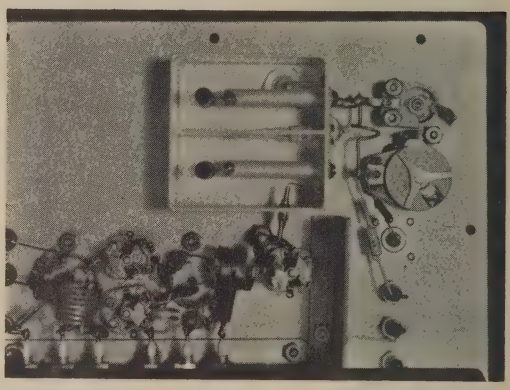
(7) There are a number of minor errors and omissions in the schematic, none of which are real critical. The manufacturer has been notified, and by the time this is printed, these may have been corrected.

(8) The Lafayette HE-61 VFO (sold separately for $19.95) plugs into the HE-45A without any wiring changes, and works very nicely. (Like just about all VFO's, it does drift a bit). The VFO offers that extra operating convenience that makes the HE-45A a real pleasure to operate. Used with the HE-45A spot switch and S-meter, the VFO lets you "zero-beat" any signal on the band, instead of being tied to a few specific crystal transmitting frequencies.

You can operate the HE-45A right out of the box by plugging it into the wall or your 12 volt cigarette lighter and connecting it to an antenna. However, with the changes I've described you'll get better reports, have greater range and enjoy more operating convenience. It's really worth the effort!

Review No. One

MESCAL ENGINEERING 1296 CONVERTER



It is always extremely interesting to note the progress that amateurs make in the VHF-UHF field and it always gives one a sense of pride to note that more and more products are being placed on the market and utilized now by the VHF-UHF minded amateurs throughout the United States. Quite recently we had the pleasure of seeing something new in the VHF-UHF field which should go a long ways toward furthering interest in our higher frequencies. The item we are referring to is Mescal Engineering's new 1296 Mc converter.

Following the converter from the start, the basic crystal frequency lies in the 21.3 Mc region. In turn, this crystal-controlled frequency is multiplied in the frequency-multiplier chain on up to 576 Mc by the vacuum tube stages. The final multiplication is handled by a germanium diode that doubles to 1152 Mc (144 Mc below 1296 Mc). The general construction of the local oscillator-multiplier chain is such that little difficulty was experienced in tuning up the converter during tests of its performance. In checking the overall stability, the unit was more than satisfactory for average AM and CW work, provided that a regulated power supply is used. Concerning drift, there is some during warm-up but this settles down after about 5-minutes and only a minor amount exists from then on.

The most interesting part of the converter proved to be the two side-by-side cavities in the front end, one cavity functioning as the L-C combination for the multiplier diode and the other cavity serving as the mixer cavity. The cavities are made up of silver-plated brass with ¼" center conductors that are grounded to one end of each cavity and tuned capacitively by piston trimmers that are connected to the open or free end of the center conductors..

Antenna input or coupling to the mixer cavity is by the inductive mode as is the coupling between the multiplier diode and the multiplier cavity. Coupling the injection signal from the oscillator-multiplier chain cavity and the incoming signal from the input cavity to the mixer diode (1N21C) is via the aperture method with the crystal mounted directly across the aperture proper. The tip of the crystal diode is grounded directly to the wall material of the center partition in the two cavity assembly. The base of the 1N21C crystal is isolated from ground by the use of Teflon insulation (about 1 mil). Since the output impedance of the crystal mixer diode doesn't look like anything that would match a coaxial line and subsequent equipment, the Mescal people have solved this problem by using a pi-section to facilitate a match between the crystal and the line. This type of coupling was found to be very efficient and able to provide a proper match. It should be mentioned at this point that the converter is designed to feed a low-noise 2-meter converter for optimum performance. If a good 2-meter converter is used, a 1296 Mc signal of less than 1 micro-

volt input to the Mescal Engineering converter will produce an acceptable headphone or speaker level.

Some time was spent with the various cavity adjustments to find out just how difficult it would be to align them. No trouble was experienced here which is attributed to the very solid construction of the cavity assembly and the use of sealed piston trimmers, no mechanical flex to upset the tuning process. Best performance seems to occur with both cavities peaked for maximum output as indicated by the receiver output levels and using no more than about .5 ma. of crystal current which is readily metered through a crystal current jack on the top of the chassis.

Nothing was found slighted in the entire converter and liberal use is made of feed - thru and low - inductance by - pass capacitors to insure minimum leakage. So, if you are interested in 1296 Mc activity and need a good converter, Mescal Engineering produces one that should give you a lot of pleasure and enjoyment.

W5HCX

Review No. Two

HI-TRONICS 6CN

Ever work WØKMV on six meters? Jack Cox lives in Kansas City, Missouri, and he has been building converters for six meter buffs for about a year or two now. Jack's one of our staff members, so we repeatedly had to beat him over the head to get him to send us down one of his "Hitronics" units for evaluation. He though other VHF'ers would feel his letting us review the 6CN converter would border on crass commercialism. We disagreed, insisted and he finally relented.

That was back in December. He's been calling us on the phone every few weeks since.

"How do you like it?" he asks.

"Fine" was our usual answer. "We're still testing it for overload and cross modulation."

Which we were.

Trying to find some signs of cross mod and overload would have been more descriptive.

December, January, February, March and finally April. The winter Es season came and went, local contacts came and went, several hundred hours of converter use came and went. Still no cross mod or overload.

When all is said and done, the logbook page signed and the QSL's dropped into the mail, you can only expect one thing of a six meter converter these days. Or at least only hope for one thing. A converter that keeps the cotton-picking local signals out from behind, around and under the DX signals. Low noise front ends we all got. Low noise mixers we all got. Lots of gain we can get, if we don't mind cross mod and garbage.

Elimination of cross mod we can't always get. In fact, can seldom get.

Jack's done it.

His model 6CN is a straight forward Nuvistor design using 3 6DS4's. One is the very low gain (who needs high gain at six when you have a good i.f. strip, and, sufficient gain to overcome the conversion losses?) r.f. stage.

Ahead of the first 6DS4 is a low pass filter for ridding your converter of annoying channel two (etc.) television garbage. If the TV garbage can't get past the input stage, it certainly can't cause trouble in the mixer. Chalk up one good idea, right off the bat.

The second 6DS4 is a mixer. Here Jack has gone to cathode injection from his third 6DS4, which serves as an oscillator. A 43 megacycle crystal gives you a 7 Mc i.f.

The cathode injection approach is one way of keeping your mixer cross mod down to a bare minimum, and is about the only logical approach to Nuvistor mixers on six meters.

The unit mounts on a tiny aluminum chassis, is completely shielded and the power supply is well filtered.

The response curve we measured ran flat from 50.0 to 51.8 megacycles.

We found one trouble, which was traced to a defective Nuvistor socket. The 6DS4 in the mixer was intermittent. Changing 6DS4's didn't help. The socket had a minute crack in it which released pressure from one or more of the pins. No pressure, no contact, and no mixing. Also no sweat, the socket manufacturer was responsible.

Jack's Hitronics Model 6CN is now being handled in such stores as Burnstein-Applebee so there's a chance you can find one locally to play with. If you can't, just drop Jack a line at Hitronics, 4716 Evanston, Kansas City 33, Missouri. Enclose a check for $49.95 plus enough to cover postage. Tell him what i.f. ranges you want.

Or run him down on six SSB. He's around 50.110 with his new Hitronics SSB converter. Which he also doesn't want us to tell you about. Darned crass commercialism.

Review No. Three

GONSET 220 COMMUNICATOR

There's a saying in ham circles that goes like this, "If you've seen one Communicator, you've seen them all."

Well, except for a casual look-see at Parts Shows and communications fairs, we really hadn't paid very much attention to the Communicator IV series. I guess we thought like a lot of others that it was merely a Communicator III with a new case.

It isn't.

We've been playing with the model 3351 Communicator IV, which covers 220-225 Mc/s. And we'd like to tell you about it.

First of all, we have an increased power rating of around 20 watts input. This is to a time-proven 6360 tube, and at 220 Mc/s we have 8.5 watts into a calibrated load, output.

Next, the IV series is high level plate modulated with ten watts of AB-1 audio from a pair of 6BQ5's.

On the transmitter, the IV series has eliminated everything except final loading and plate dipping, through ranged variables at the lower stages. You start off with an 8 megacycle crystal (divide the final frequency by 27), and these are common in surplus.

You may recall that past Communicator series featured push-to-talk, if you wanted to add it as an accessory. This has been eliminated with the IV. It's standard equipment.

Taking advantage of the recent frame grid tubes, a 6FY5 gives you approximately 7-8 db front end noise. Not DX quality, but a good start. The 220 unit in particular (we can't speak for the six or two meter units) has one major from-factory receiver disadvantage. The i.f. bandpass is flattened out to 18 kc to meet O.C.D.M. requirements (receiver drift and inexperienced operators, you know). Gonset tells you how to remove a 4.7 mmf coupling capacitor on the top of three i.f. cans to narrow this up to 8 kc. However, we found here that the effort involved to get at the 4.7 mmf capacitors didn't make the conversion very attractive. Receiver alignment is required after clipping the 4.7 mmf's.

Receiver sensitivity is good in terms of signal-to-noise ratio and audio recoverability. There's just enough difference between the 144 Mc/s band and the 220 Mc/s band that background noise practically doesn't exist on the higher band. This makes signals of a weaker magnitude more readable, in terms of s/n on 220. Ignition pulses are all but non-existent, dropping off rather sharply between 180 and 200 Mc/s.

We found the transmitter tuning a bit critical. It didn't always dip at the same spot. The loading control is quite broad if you have a flat line. The loading control is

a variable on the cold side of the link coupling, to ground.

Our hats off to the fellows responsible for the transistor power supply. This is a big improvement over the vibrator approach.

Mobile operation on 220 is a ball, if you have the activity to support it. Noise elimination is no problem . . . there isn't any noise. This makes mobile to mobile, or mobile to base range decidedly superior to 6 or 2.

The IV has a spotting switch, squelch, and room for six crystals on the rear panel socket array. Separate power cords are used for 12 vdc and 115 vac, standard form.

Still missing is a method of keying the unit, but Ed Tilton has been fighting this battle for years so I won't hope to make any progress in this area. They could use a dial light under, above or in the S meter assembly too. The two speed vernier dial is handy, no backlash, but you really don't need it if you end up leaving the i.f.'s 18 kc wide at the 6db points.

Price range is near $400, but don't let that stop you. It's a great deal of communications package for the size, and a fine improvement over earlier Communicator models.

Review No. Four

CUSHCRAFT 220 MC 32 ELEMENTS COLINEAR

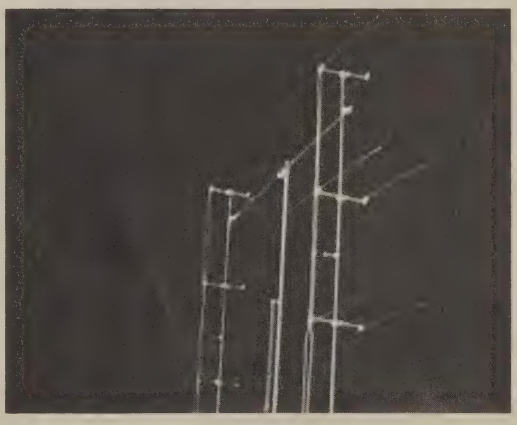
The Cushcraft Company, 621 Hayward Street, Manchester, New Hampshire, has a 16 element colinear array for 220; price is in the $15 region. At less than a dollar an element, we decided to go for a pair with the companion ½ wave matching transformer. Total price for the entire 32 elements came to just over $35.

For this we have between 16 and 18 db forward gain, depending on how you measure it, approximately 20 db front to back ratio and a forward lobe around 25 degrees wide at the ½ power (6 db) points.

This is a substantial antenna on 220, the big thing being capture area. Capture area is a function of how much frontal side the antenna presents to the oncoming signals. On 144 Mc/s and above, DX work is pretty well dependent on having as much signal-capturing ability as possible.

In terms of stacking a few yagis, a box of four yagis (any number of elements) would give you pretty close to the same capture area as a 32 element colinear.

The case for the colinear proven, we set out to assemble Cushcraft's version. A single 16 element Cushcraft on two meters is worth about 70 minutes of your time. A single 16 for 432 is worth 30 minutes, from box to mast. The 220 version falls about midway in between these figures. Two 16's double your time, and the phasing lines and 32 element kit (which consists of two verti-



cal masts to hold the two 16's, and two horizontal bars to fasten the 16's together, and to the mast) require another hour.

Cushcraft apparently has a master craftsman handling the holing drilling exercise. Everything goes together without any reaming, tugging or cursing. Even the nuts and bolts come out even, although you will probably have a handful of washers left over. Somebody in New Hampshire sure can't count washers. Or maybe **we** left some out.

The ½ wave matching line is most convenient. Tie your two 16's to the top end of the aluminum bars, your coax and balun to the sliding studs and turn on the rig. The shorting bar on the bottom of the line is slid up, and down, while you keep track of the VSWR (reflected power). At some point near where Cushcraft had pre-set the sliding bar, your SWR will drop to nothing and bingo . . . your array is matched. With 120 watts going up 100 feet of 8214 Belden cable, we had absolutely no reflected power. None. On a calibrated meter yet.

This surprised us because the lowest VSWR we could manage with out 32 element 144 Mc/s array was 1.2 to 1. And the lowest with the 432 - 32 element array was 1.1 to 1.

What more can you say. The beam is rugged, lightweight, easily turned with a TV rotor. It works to perfection, is inexpensive, gives good gain and reasonable front to back. Only Cushcraft makes it.

SUGGESTION

Cushcraft provides flat 300 ohm twin line for phasing lines, pre-cut to the proper length.

At 144 mc, with low power, this might be an acceptable practice. At 220 mc even the low power doesn't make up for the inherent inefficiency of twin lead at this frequency. And at 432, the use of twin-lead certainly cannot be justified by a serious operator.

We have found that switching to and making up suitable 300 ohm open wire line phasing lines is much the better product, especially if you are going to run more than 50 watts to the phased and stacked array.

At 220 mc, the half wave line is not sufficient to meet the physical stacking requirements. A full wave line (4' 3.6") of 300 ohm open wire line is an excellent substitute and will undoubtedly contribute to much longer operation at the power levels we contemplate, regardless of whether the weather is wet or dry.

SOUTHERN CALIFORNIA VHF JAMBOREE

June 14 to 16

The first annual Southern California VHF Jamboree, sponsored by the Microwave Society of Long Beach, Inc., will be held at the Lafayette Hotel, in Long Beach, California, from June 14 to 16. This first large event, on the west coast, for the radio amateur with interests in the VHF and UHF bands, is expected to draw attendance from all parts of the United States.

An important part of the Jamboree will be the many features and special events. Electronic exhibits, by the top manufacturers, showing the latest models of VHF, UHF and microwave equipment. A tour through the new and modern antenna laboratories of Douglas Aircraft Company. The military will have unusual electronic exhibits. Special features are a MARS station, on wheels, operational and with self-contained power, and an OSCAR tracking station.

Technical talks covering a wide variety of VHF, UHF and microwave topics are on the general program. These will cover antenna systems, transmitters, converters, transistors and diodes, sideband for VHF, to mention a few. A special VHF breakfast will have outstanding speakers on many subjects of interest to the radio amateur. Included in the Jamboree will be many contests and prizes. A special prize for the most novel and original QSL card plus a prize for just any QSL card. The selection of prize winners will be made during the Jamboree. In addition, several awards will be presented to the radio amateurs who have advanced the art during 1962.

Preregistration including the banquet, before May 15th, is $5.50 per person or $6.00 at the door. Preregistration for general admission only is $2.50 at the door. Make all checks payable to Microwave Society of Long Beach, Inc., and address to P.O. Box 3303, Long Beach 3, California. All inquiries should be addressed to Southern California VHF Jamboree and to the same P.O. Box. Not included in the registration fee are meals which are priced at a nominal figure of $1.50 for breakfast, $2.00 for luncheon and $3.00 for supper.

Hotel reservations can be obtained directly from the Lafayette Hotel. Accommodations are from $7.50 single to $12.00 for twin beds. Bus travel is excellent to all points in the Los Angeles-Long Beach area.

Vital Happenings & Facts

OPERATING AND DX NEWS

144 MC news is the talk of the VHF bands in the south. Sure enough, six meters is wide open daily. But that ceases to be news this time of year.

K1TJK, Thomaston, Conn. reports finishing work on a 220 watt linear (60 watts out) he calls the rig his "tube tester" because it was built up to 'test' 4X150's. He's using a 24 foot long John on two and notes his 410 foot location is surrounded by hills up to 900 feet in all directions.

W1JSM, Waltham, Mass. reports working W3ARW, Eastern Pa. and hearing K4EUS in April. Back on the aurora of February 9 he heard W9ZSC, Indiana.

W1VXL (K1ABR operating), Cranston, R. I. notes a sub-par tropo opening on March 29 with 2nd, 3rd district stations heard and worked. W4OLK on CW was also heard.

K1PLR, Stamford, Conn. took down his 22 element array, cleaned it up, and assumedly re-erected the monster.

K1QGY, Nashua, N.H. will sked stations needing his state on two. His frequency is 144.150 plus or minus a kc. He recently improved the operation of his 5894 SSB mixer final for the band, and added a surplus RDP panadapter.

Walt, K1RTS, reports on two meter news in his section of Connecticut, noting "activity much improved on the band since the first of the year". K1SBM has a new 16 element colinear up. 40 stations are active on two within ten miles of Waterbury.

WA2VKK, New York City, reports working K1TGI, Riverside, Conn. with 58 signals both ways. The Connecticut station was running 75 watts.

K3DFU, Waynesboro, Pa. is new to two meters with the 6360 August QST rig and some 5 element yagis.

K3KEL, Montoursville, Pennsylvania, added keying to his two meter rig (excellent move!) and notes good trop March 30 with stations in Ohio, Virginia, West Virginia, Indiana and western Pennsylvania coming through. A very low ground fog was the apparent cause of the opening with the band still open on March 31 at 3 AM when Dav retired.

W4VIW, Greenville, S.C. wants skeds on two. Who needs South Carolina? LeRoy has 200 watts CW and slightly less on AM with Spiral-Ray yagis mounted. Write him at 213 McDonald Avenue.

W4VRV reports good ground wave the nights of April 1 and 2 (apparently the March 30 Great Lakes opening drifting east.)

W4MNT is new to the scatter medium from Florida. With the luck K4IXC has had from Melbourne, W4MNT (Orlando) should have a ball. His gear is a kilowatt to a pair of eight element yagis on 144.069 mc/s. He worked 5 North Carolina stations (W4MKT, K4MHS, K4YYJ, W4BUZ and W4FSO) during a small opening in March.

Brownie, W3HB operating mobile in 4-land April 17 caught one of those southern tropo openings that we all hear about but seldom get in on. Enroute to his home QTH in Bethesda, Maryland from Pompano, Florida, he spent the night of the 17th at Charleston, S.C. He found himself in a six way with WA4FXX, WA4ICB, K4ZAW, all in Charleston, and W4UWH in Auburndale, Florida, WA4DRJ, Winter Haven, Florida. All signals were running 58-9. And Brownie was only running his Communicator 3 and halo.

Brownie quickly broke out his folding six element beam (we should all carry one) and later proceeded to work W4UWH who also went mobile. UWH was using his Communicator IV and 4 element portable beam. The distance between the two, fixed-mobile to fixed-mobile, was 340 miles. Anyone

want to challenge this mobile-to-mobile distance mark on two meters?

With that introduction to two meter DX work along the southlands, let's see what really happened during April.

WA4AME, Jensen Beach, Florida reports working W5TYI, Alice Texas at 2315 (S9 both ways) April 9, and W5DCV, Austin, Texas (S7 both ways) April 10th. On the 11th he snagged WA4FLM, Mobile, Alabama and WA4KEJ in Prichard, Alabama. Some DX!

W5BEP, Longview, Texas caught W7-JCU/4, Mobile, Alabama at 2350 CST on April 9th, W4TDO, W4AWS and K4NTD (all Florida) around 0740 CST on April 10th!

K4OCK reports hearing three stations in Dallas S9 plus the evening of the 9th and again on the 10th. Poor Jack had his transmitter torn down. He's in the Miami area.

In other 5th district news **W5LTR,** Albuquerque, reports finishing up a 4-125A final with SSB mixer for two meters and notes a group has started a VHF club in the City. The net frequencies at 1915 hours are 50.28, 134.440, 222.5 and 432 megacycles.

K5DZM, Grapevine, Texas, a little north of the general Texas DX activity in April, reports working K5CTJ/5, Alma, WA5-DGL, Shawnee, and K5SWL in Duncan, Oklahoma April 8, plus W5FUA and W5-CTJ in Austin and K5JNW, San Marcus. The same tropo conditions repeated on April 9 and 10.

Activity in six land must be down from all previous months. Everyone waiting for summer to occur? **K6GTG** fills us in on what he has been doing of late. His two meter rig consists of a kilowatt CW or SSB into a 20 element beam. A 417A front end makes up the receiver. Bill is still in Arlington, and interested in schedules. Drop him a card at Box 4011, Riverside.

A new aurora-scatter enthusiast up in the northwest. **W7WVE,** Seattle wants some interest shown. Dick is running a KW on 144.043 with a 28 foot boom yagi. Receiver is a Drake 2-B and 416-B preamp. He's been watching the weather maps on the Seattle to Anchorage mostly over-water path

and feels that something could be done if some high powered gear were put on the air in the 49th state. He can also run NBFM but would rather stick to CW for DX work. Interested parties can contact him at 11602-2nd, NW, Seattle 77, Washington.

A Novice DX enthusiast, **WN8HTL,** Detroit reports working into Western New York and northeastern Ohio on April 18th.

WA8DSN, Dayton, Ohio notes working K9OVR, Summitville, Indiana and W9-BRN, Fort Wayne.

K8TLO, Bud in Ann Arbor, Michigan reports his SSB heterodyne unit perking and a 4X150A to finalize it in the mill. He heard K2KGN and W3GBL early in the evening of March 28th.

K9ZUF, Aurora, Illinois has been bitten with the two meter DX bug, having worked 8 states with his Two'er! A new receiver, and a 50 watt transmitter is now operating.

W9JFP, Milwaukee reports two meters good in the 300 mile range, but it wouldn't stretch out, on April 6 and 7. Stations in Michigan and Indiana were worked with ease.

WAØDZH, Marion, Iowa reports he is holding schedules with WØBJV (300 miles) and WØZJB (250 miles) every Sunday, Monday and Thursday nights at 2030 and 2100 CST respectively.

Bob Swanland, **WØWYX,** atop Squaw Mountain, Colorado fills us in on VHF news from his area. KØDAP, Fleming, Colorado has changed his WØWYX schedule to 0630 MST over the 153 mile path.

WØFA has a new slot antenna on the air and is looking for DX.

KØUFA has a new 300 watt linear on the air and his DX to date has been KØDAP and K7HKD.

KØKZI in Pueblo is now working into Denver stations.

KØBAG was worked by WØWYX for the first time on April 9, and is consistently working Denver stations.

A nice long report from Chuck Kuespert, KL7CEO, Fairbanks, Alaska waters the mouth DX wise for some of us less mountain-fortunates.

Back on Feburary 8th, KL7ECO, using a Heath Two'er and a homebrew 3 element beam up 20 feet made it two-way with

KL7CLH, Tunana, Alaska by bouncing signals from Mt. McKinley. This is a 330 mile path! KL7CLH runs a full 280 watts output to a colinear array and homebrew 417A converter for receiving (he sounds like a good prospect for scatter).

Regular daily QSO's are being made between KL7IS at Lake Minchumina running a Heath Seneca and KL7ECO using a Two-er, with Q5 signals both ways. Two way has also been made with the Heath Two'ers on each end. This is a 240 mile path, again Mt. McKinley is used as a reflection surface.

KL7ECO, encouraged by this kind of goings on has added an Ameco Nuvistor converter, BC-348, Heath Seneca and 8 element wide spaced Telrex beam!

Also on the air in Fairbanks is KL7DMB, running a Zeus and Interceptor (hey—is he also on six, Chuck?) KL7BET is also on two meters, he runs RTTY with DMB. KL7BET has had the 240 mile Mt. McKinley to KL7IS RTTY path running and has copied 330 mile RTTY signal of KL7CLH. What's more, he has worked KL7ALA/mobile in Anchorage at 210 miles!

VE3BQN, Willowdale, Ontario, Canada reports what must be the first Canada to Florida two meter work when he snagged K4IXC in meteors. He uses a 15 over 15 array 71 feet up (19 feet between bays!) fed with foam heliax line. And he notes, "Thanks for your article on meter shower procedures. Decided to try it and had a contact with K4IXC in short order."

50 MC NEWS is all of the unusual calls showing up on six meters during the first week of May.

Rather than detail out-dated openings that hit throughout the country in late April and early May, let's concentrate on the real DX news.

VP5BB and VP5CH are definitely on the air at Turks Island. Several W4 land stations report direct to this desk that they have worked the pair on several occasions. It appears they may be sharing one rig.

FG7XT showed on six meters the night of May 4 working stations around Delaware, Pennsylvania, Long Island. He's located on Guadalupe approximately one short hop southwest of Puerto Rico. His frequency is 50.105 megacycles, and he's on AM. He had been heard on 20 meters talking about going on six this spring. He made it.

Stations in Connecticut and Florida, and perhaps elsewhere, worked his Sunday morning the 5th of May. VE4MA in Winnipeg said he was hearing W4's in Florida calling the FG7 Sunday morning, the 5th, and he may have heard the French island station in Winnipeg. That would be some haul! VE4MA is only a few kc lower than the reported frequency (50.105) for FG-7XT.

KV4CQ keeps cropping up as active. He would be on the Virgin Isles, just east of Puerto Rico. He's been there before. Tnx to K3KEO for this one.

Also Tnx to K3KEO for VP9AK, Bermuda. This one has gear. We knew he had gear last year, but he apparently isn't very active. Bermuda is but 850 miles of the North Carolina coast.

K4OCK reports VP5CW active on 50.-115. We assume he also is on Turks.

VE4KZ was heard on CW batting it back and forth with the stateside gang May 5th.

A VE on CW is a rare bird indeed on six. His frequency was 50.020.

SSB state hunters on six attention. This is the status of activity as we have it doped out here at press-time.

If you know something to the contrary, get ahold of W5KHT on the air or airmail in that DRP card.

(We are only interested in states currently sporting activity.)

The following states are apparently not active on SSB, 50 megacycles.

Maine
Vermont
New Hampshire (W2NSD not excepted)
Connecticut (W1HDQ not excepted)
Arkansas
North Dakota
Utah
Nevada (K7ICW can go SSB but he likes CW. You'll have to drag him up on sideband.)
Oregon
Idaho (W7UBI has moved to Missouri)

Some of the rare states on now include Montana (W7HDP, Great Falls is most active), Rhode Island (K1ZPF was heard on May 4), Delaware (K3KEO is very active) and Arizona (K7JUE is also tres active).

220 AND UP news is climbing. If this isn't just a temporary thing due to the coming VHF contest(s), someone should make some 432 DX news this summer for sure. Keep in mind the 432 world record is less than 700 miles. Had someone been active in Florida with decent power and antennas during the April 8-10 openings from Texas to Florida, surely an across the Gulf contact would have been made. This is a 900 mile plus path just waiting for two guys to turn on their spring time receivers.

W1JSM, Waltham, Mass. reports his 8058 converter is finished and he has a 16 element colinear up.

W1VXL (operated by K1ABR), Cranston, R.I. built up the Handbook 220 rig with converter. He's pushing for more cw activity on all bands.

W2SEU, Freeport, Long Island had first contact on 432 with W2MDE using an 11 element beam on 432. He notes that 220 activity is on the upswing with many new stations around the Hudson River area of

New York.

W4TLC finished up his 432 plate line for his 4CX250B amplifier. He says he's getting 30 watts from his 144 tripler. He also finished up his 432 converter which uses a 1N82A mixer among other things. He's in Taylor's, South Carolina.

K8TLO, Ann Arbor, Michigan reports putting up a 16 element colinear for 432 and he has some 2C39A's ready to juice the birds.

WAØDZH, Marion, Iowa reports he has the 432 coaxial cavity with 4CX250 plugging along on the bench and a 13 element 432 yagi mounted in the air.

W5KHT is on 220 megacycles (220.050 to be exact—where does everyone else hang out in this part of the country?) with 115 watts or so up the line to a 32 element colinear 50 feet above the hill. Who wants Oklahoma on this band?

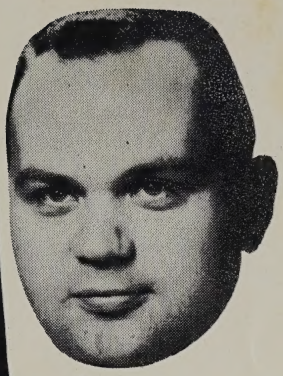
PARTS LIST

C1 — 3-30 mmfd trimmer
C2, 4, 7, 8, 12, 14, 15 — 1-10 mmfd tubular
C3, 5, 6, 10, 11, 13, 16, 17, 18, 19 — 0.001 mfd
C9 — 25 mmfd tubular
R1, 4 — 100 ohm ½W 5%
R2, 6, 7 — 47K ½W 5%
R3, 8, 10, 12 — 1K ½W 5%
R5, 13 — 470 ohm ½W 5%
R9 — 10K ½W 5%
R11 — 680K ½W 5%
L1 — 3 turns, No. 18 tinned wire, ½" diameter
L2, 3, 5, 6 — 4 turns, No. 18 tinned wire, ½" diameter
L8 — 10 turns, No. 22 enameled wire on ¼" slug tuned coil form
L9 — 3-4 turns No. 22 enameled wire on cold end of L8
L4 — 6 turns, No. 18 tinned wire, ½" diameter
L7 — 5 turns, No. 18 tinned wire, ½" diameter
XTAL — 37.8333 mcs (See text for other IF's)

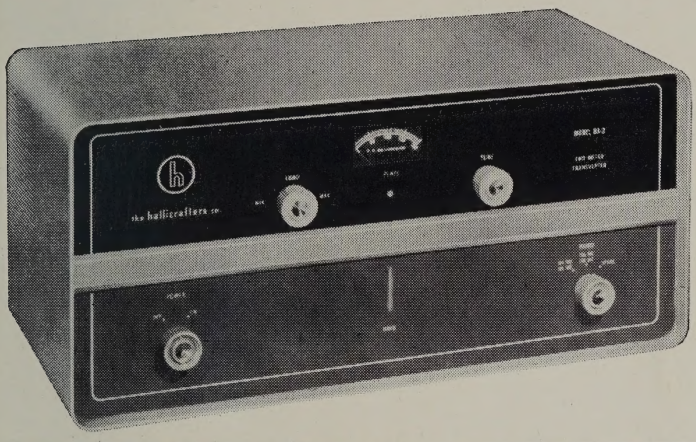
Look how easy HALLICRAFTERS Gets you down on 6 or 2

HA2 or HA6 Transverter Only $5 DOWN!

Take 1 – 2 or 3 Years to Pay



Terry—
W9DIA



Hi! I'm Terry, W9DIA . . . and I can tell you that Hallicrafters V H F Transverters make getting on 6 or 2 a real pleasure. Feed the output of your 10 meter rig into this gear . . . and convert to VHF . . . AM, CW, RTTY, SSB or FM also. Converts VHF signals for reception on 10 meters. Any exciter from 10 to 100 watts does the job. Either unit is yours for $5 down, and you have up to three years to pay on my easy terms. TRADES? Sure . . . find out why they call me "King of Traders." Order today. Just shoot the coupon back with a $5 bill and leave the rest to me.

SEE HOW LITTLE YOU PAY MONTHLY AFTER $5 DOWN PAYMENT

	1 year	2 Years	3 Years
HA 2 Transverter $349.50	$31.57	$17.22	$12.44
HA 6 Transverter $349.50	31.57	17.22	12.44
P 26 Power Supply $99.50	8.66	4.72	3.41

WE HAVE THE BEST IN RECONDITIONED VHF GEAR . . . Write for latest list.

STAY ON THE AIR PLAN

Yes — Now you can enjoy your new Hallicrafters equipment without going off the air. You need not ship your trade-in in to us until you receive our shipment, and make sure that your new merchandise is in good working condition.

AMATEUR ELECTRONIC SUPPLY

THREE STORES TO SERVE YOU

Please send mail orders to Milwaukee Store
3832 West Lisbon Ave., Milwaukee 8, Wis. • PHONE WEST 3-3262

CHICAGO 31, ILL.
6450 Milwaukee Ave.,
PHONE RO 3-1030

ORLANDO, FLORIDA
23 Azalea Park
Shopping Center, Phone 277-8231

Send all mail orders and inquiries to
AMATEUR ELECTRONIC SUPPLY
3832 W. Lisbon Ave., Milwaukee 8, Wisc.

Ship me .....

I enclose $.....; I will pay the balance

☐ C.O.D. with 10% deposit ☐ 1 year ☐ 2 years ☐ 3 years

I want to buy ..... and want to trade

..... What's your deal?

Name .....

Address .....

City ..... Zone..... State.....

☐ Send reconditioned equipment and sale bulletin.

VHF HORIZONS
P. O. BOX 1557
OKLAHOMA CITY, OKLAHOMA

BULK RATE
U. S. POSTAGE
PAID
Permit No. 7
Okla. City, Okla.